Updates to acd simulation and recon

Acd Recon Geometry Updates

Not much to report here, lots of changes, but almost all internal to AcdRecon/ AcdUtil. Only important thing that rotations must agree between AcdUtil and xmlGeoDbs.
These changes are in place to handle trapezoidal tiles and arbitrary definitions of the rotation planes.

Acd Recon Calibration Updates

Lots of changes to how the calibrations are done. All calibrations look pretty much the same, they are just a few numbers defined for each tile/ribbon and PMT. The calibration service provides a lookup with give the values for the calibrations constants which is valid for the current event and calibration flavor.

couple of details. The calibrations themselves are just a bunch of numbers. Each calibration type has a description which provides context for the numbers. (ie, the first number is the MIP Peak, the second number is the width, etc.) these descriptions match the xml attributes in the xml calibration file. Since these is only one description per calibration type, these are defined with static instances. This has cause some problems when used of various platforms.

For the reconstruction we have 4 calibrations: Pedestals, Mip Peaks (aka electronics gains), High Range calibration and coherent noise calibration. The Pedestals and Mip Peaks are the most important ones. Those are use to convert the raw signal into a MIP equivalent and then to energy in MeV. To do this me just use a simple linear transformation, we subtract the pedestals and scale by the MIP peak value im PHA counts.

The coherent noise calibration is in place to correct for the pedestal bounce after readout. At about 1000 ticks after a trigger the pedestals can exceed the zero-suppression threshold and cause lots of spurious signals in the ACD. The size of these signals can be up to 0.05 ~ 0.10 MIP, which is about the lower edge of the range that we might consider using to veto events. Therefore we stand to gain by using the coherent noise calibration.

The High Range calibration is just a phenomelogical fit that corrects large non-linearities in the high range readout.

Acd Simulation Updates

This is where most of the really important changes happened. We totally reworked how we express the conversions from energy deposited in MeV (as given by GEANT) into observed signals. This first major change was to use all four of the Recon calibrations in the process of simulating the digi data. In addition to those four calibrations we use 3 more calibrations taken from the database, the veto and cno set points and the crossover point from low range to high range readout. Finally we also take a few numbers for an xml file in AcdDigi packages. Mainly physical constants like the mean number of MeV for a MIP, but also the mean # of photoelectrons for each tile and the edge effect attenuation constants.

Getting Acd simulation and Acd recon to agree.

It is very important that the calibrations used in the simulation and the reconstruction are consistent (otherwise we can lose hits, or make spurious hits). In general, the pedestals and MIP peaks should use the same calibrations. For the time bieng all the high range, cno and range crossover calibrations can be ignored. (or set to their "ideal" values). However, it is very important that the veto calibration be consistent with the pedestal and MIP peak calibrations. All three are expressed in terms of PHA counts, so if the veto calibration is not consistent, the simulation of the acd veto (and therefore the simulation of the trigger and filter logic) can be badly misrepresented.